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Federowicz et al.

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(54) **MIXED-MODE LIQUID VENTILATION GAS
AND HEAT EXCHANGE**

(56)

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(57) **ABSTRACT**

Related U.S. Application Data

- (63) Continuation of application No. 09/410,814, filed on Oct. 1, 1999, now abandoned.
- (51) **Int. Cl.⁷** **A61M 16/00**; A62B 7/00
- (52) **U.S. Cl.** **128/204.18**; 128/913; 128/201.13; 128/203.26; 128/207.14
- (58) **Field of Search** 128/203.26, 203.25, 128/204.17, 204.15, 202.26, 202.25, 201.21, 201.13, 913, 207.14, 204.18; 62/259.3

A novel technique for ventilation and heat exchange is disclosed called Mixed-mode Liquid Ventilation (MMLV). This technique uses an endotracheal catheter to add and remove liquid from the lungs continuously and/or cyclically, and deliver gas at a rate independent of the delivery of liquid. This technique produces small-scale mixing of gas and liquid in the airways, allowing for efficient gas and heat exchange. Medical uses for the technique are disclosed. These uses include induction and reversal of hyperthermia, and hypothermia.

14 Claims, 29 Drawing Sheets

